

# Lecture Module - To Err is Human

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

## Topic 1 - Accuracy and Error

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- Accuracy and Error
- Estimating Error
- Uncertainty Interval
- Activity with Data!

## Accuracy and Error

The exact value of a variable is called the \_\_\_\_\_. The value of the variables as indicated by a measurement system is called the \_\_\_\_\_. The \_\_\_\_\_ of a measurement refers to the closeness of agreement between the measured value and the true value. But the \_\_\_\_\_ is rarely known \_\_\_\_\_, and various influences, called \_\_\_\_\_, have an effect on both of these values. So the concept of the \_\_\_\_\_ of a measurement is a one.

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## Estimating Error

The \_\_\_\_\_ can be estimated but cannot be known \_\_\_\_\_. In practice a \_\_\_\_\_ value is used in place of the true value. We will discuss this again the the *Calibration Module*.

An estimate of error based using this value is sometimes referred to as \_\_\_\_\_.

## Activity with Data!

“The \_\_\_\_\_ is a numerical estimate of the possible range of the error in a measurement. In any measurement, the \_\_\_\_\_ is not known exactly since the true value is rarely known exactly. But based on available information, the operator might feel confident that the error is within certain bounds, a plus or minus range of the indicated reading. This is the assigned \_\_\_\_\_.”

We will discuss this again the the *Uncertainty Module*.

Text: Theory and Design of Mech. Meas.

# Activity with Data!

**Experiment:** We are going to collect data with the sensor suite on our phones.

Sensor:

- GPS - [concept graphic](#)
- [info from manufacturer](#)

Logger Apps:

- [sensorlogger \(Android\)](#) - Kelvin Choi
- [Sensor Logger \(OSX\)](#) - Choi Tsz Hei

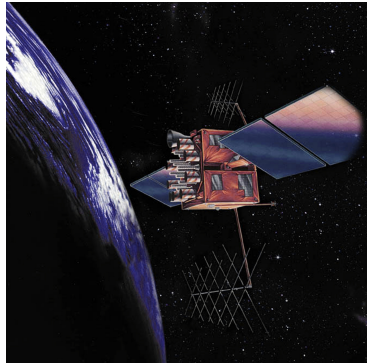


Image: [Wikipedia](#)

# Activity with Data!

**Part 1 - Informed Prediction:** Generate data you expect the GPS in your phone to report. Show the data points on the graph to the right.

$i$	$lat_i$	$lon_i$
1		
2		
3		
4		
5		

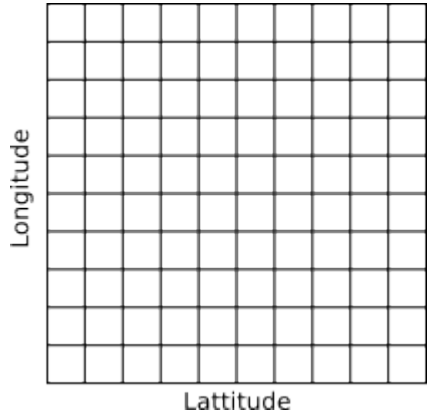


Image: thill

# Activity with Data!

**Part 2 - Measurement:** Record GPS from your phone. Show the data points on the graph to the right. You can use export feature in Sensor Logger to report the data.

$i$	$lat_i$	$lon_i$
1		
2		
3		
4		
5		
6		
7		
8		
8		
9		
10		

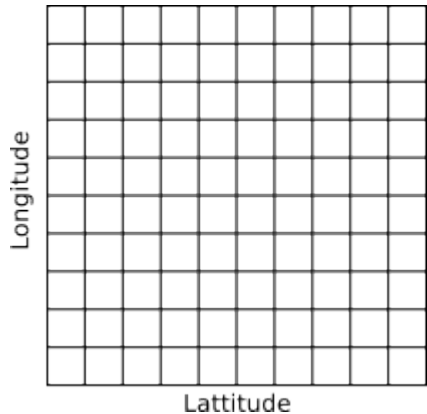


Image: thill



# Activity with Data!

**Part 3 - Analysis/Results/Conclusions:** Compare and contrast the two sets of data.  
What conclusions can you make about your predictions or the sensor data?

- Were the predictions reasonable?
- What type of error is present in the recorded data?
- What should be used as a reference for this data?



Image: [wikipedia](#)



Image: [wikipedia](#)